

Production Techniques and Provenance Interpretation of Bricks from King Muryeong's Tomb in Baekje Kingdom

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King Muryeong's Tomb in Baekje Kingdom (1st century B.C. ~ 7th century A.D.) of Korea is famous for the identification of the owner and production era from the excavated stone epitaph-plaque. This tomb was made of bricks influenced by Liang Dynasty of China and included many historic objects showing cultural exchanges among neighbouring nations. The bricks used in building the tomb consisted of 28 kinds of bricks with patterns and letters, but there are no records of the production system and provenance of bricks. However, some bricks with similar patterns and letters were found in Jeongdongri kiln site which was located about 23km away from this tomb. Archaeologists presumed the Jeongdongri kiln site was the production workshop but there were no scientific evidence. Accordingly, this study examined the production techniques and provenance interpretation of bricks from King Muryeong's tomb with comparison of bricks and paleo soils from neighbouring Songsanri royal tombs and Jeongdongri kiln sites. This study also estimated the provenance of raw materials with interpretation of mineralogical and geochemical characteristics of samples.

For the analysis, the 13 pieces of bricks at the King Muryeong's tomb and 10 pieces at the Songsanri royal tomb for comparison were selected. The 1 piece of brick and 6 pieces of paleo soil were collected from the Jeongdongri kiln site in order to estimate the origin of brick materials.

As a result of mineralogical study, major minerals of brick samples were quartz and plagioclase, and mica was observed in some samples fired at below 900°C. 2 pieces of brick samples were presumed to have no experience of firing in the existence of chlorite and kaolinite. However, some samples fired at over 1,000°C contained high temperature minerals such as mullite, hercynite, even cordierite. Paleo soil samples consisted of quartz, plagioclase, orthoclase, mica, vermiculite and kaolinite. There are differences in mineral phase between soils and bricks, because soil minerals transformed according to the firing temperature despite of the mineralogical similarity. Under the microscope, quartz and feldspar less than 0.5mm in some vitrified matrix were observed and reddish iron oxide lumps were frequently observed in most of the bricks from King Muryeong's tomb. The contents of major, minor and rare earth elements of brick and soil samples were measured in order to identify the genesis of them. As a result, brick and soil samples had similar enrichment and deficiency aspects of major, minor and rare earth elements. It indicates that they have suffered same evolution process from the original sources. Accordingly, bricks of King Muryeong's tomb and Songsanri royal tombs are judged to be produced with soils of Jeongdong-ri site as raw materials and carried along the river to the tomb.

As most of the samples have less than 0.5mm in their matrix and SiO₂ contents of about 56 to 67 wt.%, lower than that of soil, it seems that the macrocrystalline materials were removed in making process. However, paleo soils had lots of reddish iron lumps in their texture such as those of bricks, showing the additional evidence of provenance assumption.